

Supplementary Table 1. Associations between weight change and risk of breast cancer by cohort among women aged 50 years or older in the Pooling Project of Prospective Studies of Diet and Cancer.

Interval 1 (weight 2 – weight 1) <sup>†</sup>		Lost ≤4.5kg			Stable weight (within +/- 2 kg)	Gained ≥4.5kg			Other categories
Interval 2 (weight 3 – weight 2) <sup>†</sup>		Kept the weight off/lost more weight	Some regain of the lost weight	Gained all previously lost weight back/gained more weight	Stable weight (within +/- 2 kg)	Lost all previously gained weight/lost more	Lost some of the weight gained	Kept the gained weight on/gained more weight	(e.g., smaller amounts of weight gain or loss)
CLUE II: Campaign Against Cancer and Heart Disease	Cases HR* (95% CI)	2 N/A <sup>‡</sup> --	1 N/A <sup>‡</sup> --	3 N/A <sup>‡</sup> --	7 1.00 ref	5 2.92 (0.89-9.55)	7 2.25 (0.77-6.56)	19 1.48 (0.60-3.63)	42 1.91 (0.85-4.31)
Cancer Prevention Study II Nutrition Cohort	Cases HR* (95% CI)	59 0.77 (0.58-1.03)	38 0.96 (0.68-1.35)	45 0.90 (0.65-1.25)	292 1.00 ref	44 0.90 (0.65-1.25)	51 0.99 (0.73-1.33)	192 1.07 (0.89-1.29)	717 0.98 (0.85-1.13)
Iowa Women's Health Study	Cases HR* (95% CI)	71 0.89 (0.67-1.18)	34 0.86 (0.59-1.24)	33 0.89 (0.61-1.29)	177 1.00 ref	40 0.93 (0.66-1.32)	49 0.98 (0.71-1.35)	186 1.23 (1.00-1.51)	527 0.97 (0.82-1.15)
Japan Public Health Center-Based Study Cohort I and II	Cases HR* (95% CI)	6 1.00 (0.43-2.33)	1 N/A <sup>‡</sup> --	4 N/A <sup>‡</sup> --	77 1.00 ref	1 N/A <sup>‡</sup> --	0 N/A <sup>‡</sup> --	8 1.36 (0.65-2.82)	59 0.84 (0.60-1.18)
Melbourne Collaborative Cohort Study	Cases HR* (95% CI)	7 0.87 (0.37-2.05)	8 1.20 (0.53-2.74)	14 1.17 (0.60-2.28)	31 1.00 ref	2 N/A <sup>‡</sup> --	1 N/A <sup>‡</sup> --	8 0.86 (0.39-1.93)	102 0.95 (0.62-1.45)
New York University Women's Health Study	Cases HR* (95% CI)	12 0.72 (0.38-1.36)	15 1.62 (0.90-2.91)	6 1.09 (0.46-2.58)	59 1.00 ref	9 1.42 (0.69-2.93)	12 0.96 (0.50-1.86)	51 1.35 (0.91-1.98)	146 1.06 (0.78-1.45)
Nurses' Health Study	Cases HR* (95% CI)	83 0.86 (0.67-1.09)	42 0.80 (0.58-1.11)	64 0.92 (0.70-1.21)	349 1.00 ref	80 1.11 (0.86-1.41)	97 1.05 (0.84-1.32)	437 1.11 (0.96-1.28)	1002 1.00 (0.88-1.13)
Women's Health Study	Cases HR* (95% CI)	25 0.88 (0.55-1.38)	14 0.87 (0.49-1.54)	20 1.05 (0.64-1.74)	88 1.00 ref	30 0.63 (0.41-0.96)	33 0.77 (0.51-1.16)	115 1.04 (0.78-1.38)	268 0.87 (0.68-1.11)
Women's Health Initiative Clinical Trial	Cases HR* (95% CI)	45 0.75 (0.53-1.05)	32 1.02 (0.69-1.49)	29 0.89 (0.60-1.33)	154 1.00 ref	30 0.85 (0.57-1.26)	39 1.17 (0.82-1.66)	102 1.04 (0.81-1.34)	472 0.95 (0.79-1.14)
TOTAL CASES Pooled Hazard Ratio	Cases HR* (95% CI)	310 0.83 (0.73-0.94)	185 0.94 (0.80-1.10)	218 0.94 (0.81-1.09)	1234 1.00 ref	241 0.98 (0.79-1.13)	289 1.01 (0.89-1.16)	1118 1.12 (1.03-1.22)	3335 0.97 (0.91-1.04)
p-heterogeneity I-squared		p=0.99 0%	p=0.64 0%	p=0.98 0%	N/A --	p=0.21 29%	p=0.64 0%	p=0.90 0%	p=0.78 0%

Abbreviations: kg, kilogram; HR, hazard ratio; CI, confidence interval; N/A, not applicable

\*Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for body mass index at the start of Interval 1, physical activity at the start of Interval 1, and postmenopausal hormone therapy use at start of breast cancer follow-up.

<sup>†</sup>Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years. Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2). Categories of weight change in this table were collapsed from the weight change categories in the main tables because of insufficient sample size for most categories in the individual studies

<sup>‡</sup>Hazard ratios were not reported for categories with fewer than 5 cases.

<sup>§</sup>All statistical tests are two-sided

Supplementary Table 2. Change in hazard ratios when covariate groups were added to the model for weight change and breast cancer among women aged 50 years or older in the Pooling Project of Prospective Studies of Diet and Cancer.

Weight change Interval 1 <sup>  </sup> (Weight 2 – Weight 1) <sup>§</sup>	Weight change Interval 2 <sup>  </sup> (Weight 3 – Weight 2) <sup>§</sup>	Model 1* Age, cohort, calendar year only HR (95% CI)	Model 2* Model 1+ BMI, HT, PA HR (95% CI)	Model 3* Full* model HR (95% CI)	% HR change from Model 1 to Model 2	% HR change from Model 2 to Model 3	
Weight loss >2-4.5kg	Kept the weight off/lost more weight	0.91 (0.81-1.03)	0.87 (0.77-0.99)	0.87 (0.77-0.98)	4%	0%	
Weight loss >4.5-<9kg		0.90 (0.78-1.03)	0.84 (0.73-0.96)	0.83 (0.72-0.95)	7%	1%	
Weight loss ≥9kg		0.83 (0.66-1.06)	0.74 (0.58-0.94)	0.74 (0.58-0.94)	11%	0%	
Weight loss >2-4.5kg	Some regain of the lost weight	N/A <sup>†</sup>	N/A <sup>†</sup>	N/A <sup>†</sup>	--	--	
Weight loss >4.5-<9kg		1.13 (0.92-1.38)	1.06 (0.87-1.30)	1.05 (0.86-1.28)	6%	1%	
Weight loss ≥9kg		0.87 (0.69-1.09)	0.77 (0.62-0.97)	0.76 (0.61-0.96)	11%	1%	
Weight loss >2-4.5kg	Gained all previously lost weight back/gained more weight	0.97 (0.86-1.10)	0.94 (0.83-1.06)	0.93 (0.83-1.05)	3%	1%	
Weight loss >4.5-<9kg		0.99 (0.84-1.16)	0.91 (0.78-1.07)	0.91 (0.78-1.07)	8%	0%	
Weight loss ≥9kg		1.15 (0.86-1.54)	1.02 (0.76-1.37)	1.02 (0.76-1.37)	11%	0%	
Stable weight (within +/- 2kg)	Lost > 2kg	0.96 (0.86-1.06)	0.92 (0.83-1.02)	0.92 (0.83-1.02)	4%	0%	
	Stable weight (within +/- 2kg)	1.00 ref	1.00 ref	1.00 ref	--	--	
	Gain >2kg	1.07 (0.98-1.17)	1.05 (0.96-1.15)	1.05 (0.96-1.15)	2%	0%	
Weight gain >2-4.5kg	Lost all previously gained weight/ lost more	0.93 (0.83-1.05)	0.90 (0.81-1.01)	0.90 (0.81-1.01)	3%	0%	
Weight gain >4.5-<9 kg		0.97 (0.84-1.13)	0.91 (0.78-1.06)	0.92 (0.79-1.07)	6%	-1%	
Weight gain 9-<13.5 kg		0.95 (0.66-1.37)	0.87 (0.60-1.26)	0.85 (0.59-1.23)	8%	2%	
Weight gain ≥13.5 kg	Lost some of the weight gained	N/A <sup>†</sup>	N/A <sup>†</sup>	N/A <sup>†</sup>	--	--	
Weight gain >2-4.5kg		N/A <sup>†</sup>	N/A <sup>†</sup>	N/A <sup>†</sup>	--	--	
Weight gain >4.5-<9 kg		1.06 (0.90-1.27)	1.02 (0.86-1.21)	1.02 (0.86-1.21)	4%	0%	
Weight gain 9-<13.5 kg		1.00 (0.80-1.25)	0.95 (0.76-1.18)	0.94 (0.76-1.18)	5%	1%	
Weight gain ≥13.5 kg		1.09 (0.83-1.42)	1.01 (0.78-1.33)	1.00 (0.77-1.31)	7%	1%	
Weight gain >2-4.5kg		1.06 (0.97-1.16)	1.04 (0.95-1.14)	1.04 (0.96-1.14)	2%	0%	
Weight gain >4.5-<9 kg		1.15 (1.05-1.26)	1.12 (1.02-1.22)	1.12 (1.02-1.23)	3%	0%	
Weight gain 9-<13.5 kg		Kept the gained weight on/gained more weight	1.19 (1.03-1.38)	1.14 (0.99-1.33)	1.15 (0.99-1.33)	4%	-1%
Weight gain ≥13.5 kg			1.03 (0.81-1.31)	0.97 (0.76-1.23)	0.96 (0.76-1.22)	6%	1%

Abbreviations: BMI, body mass index; CI, confidence interval; HR, hazard ratio; HT, hormone therapy; kg, kilogram; N/A, not applicable; PA, physical activity

\*Model 1: Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up. Results are identical to those presented in Table

\*Model 2: Same as model 1 + body mass index (normal: 18.5-<25, overweight: 25-<30, obese: ≥30 kg/m<sup>2</sup>) at the start of Interval 1, physical activity at the start of Interval 1 (low/no, medium, high as defined by each study), and postmenopausal hormone therapy use (current at the start of breast cancer follow-up, not current). Results are identical to those presented in Table 2.

\*Model 3: Full model: Same as model 2 + race (white, black, Asian, other), education (<high school, high school, > high school), smoking status (never, past, current), height (<1.50, 1.50-1.55, 1.55-1.60, 1.60-1.65, ≥1.65 m for the Japan Public Health Center-Based Study Cohort I and II; <1.60, 1.60-1.65, 1.65-1.70, 1.70-1.75, ≥1.75 m for remaining cohorts), alcohol intake (0, >0 <5, 5-<15, 15-<30, ≥30+ grams/day), family history of breast cancer (yes, no), age at menarche (<12, 12, 13, 14, ≥15 years), parity and age at first birth (nulliparous, parous/age at 1<sup>st</sup> birth < 25 years [<30 years for the Women's Health Study], parous/age at 1<sup>st</sup> birth ≥ 25 years [≥30 years for the Women's Health Study]), oral contraceptive use (ever, never), history of benign breast disease (yes, no)

§ All statistical tests are two-sided

Supplementary Table 3. Select baseline characteristics among women aged 50 years or older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer (DCPP).

Baseline characteristics (unless otherwise noted)*	Analytic cohort	DCPP population but not in the analytic cohort <sup>†</sup>
n	180,885	51,848
Age (years), mean (SD)	59.9 (6.0)	60.0 (6.0)
Body mass index (kg/m <sup>2</sup> ), mean (SD)	26.1 (4.7)	26.3 (5.4)
Weight (kg), mean (SD)	68.3 (13.6)	68.4 (14.7)
Height (m), mean (SD)	1.62 (0.07)	1.61 (0.08)
Age at menarche (years), mean (SD)	13.0 (1.7)	13.0 (1.8)
Age at 1 <sup>st</sup> birth (years), mean (SD)	21.8 (7.7)	21.3 (7.8)
Physical activity		
Low physical activity, %	42.9	48.2
Moderate physical activity, %	29.1	25.8
High physical activity, %	28.1	26.0
Race/ethnicity		
White, %	82.6	87.5
African American, %	2.1	2.0
Hispanic, %	0.8	0.7
Asian, %	11.2	8.7
More than a high school education, %	63.6	46.1
Current smoker <sup>‡</sup> , %	9.9	14.9
Current hormone therapy use <sup>§</sup> , %	30.8	35.3
Family history of breast cancer, %	11.5	10.1
Ever oral contraceptive use, %	40.2	37.7
History of benign breast disease, %	26.9	24.5

Abbreviations: DCPP, Pooling Project of Prospective Studies of Diet and Cancer; kg, kilogram; m, meter; SD, standard deviation

\*Values are means (SD) for continuous variables; percentages for categorical variables, and are standardized to the age distribution of the study population.

<sup>†</sup>Participants were excluded from the analytic cohort for one of the following: 1) breast cancer diagnosis or death before start of follow-up or 2) missing or extreme values for follow-up 1 or 2 body weight, BMI, or height

<sup>‡</sup>Current smoking at the start of the weight change interval

<sup>§</sup>Current postmenopausal hormone therapy use at the start of breast cancer follow-up

Supplementary Table 4. Associations between weight change and risk of breast cancer by postmenopausal hormone therapy (HT) use among postmenopausal women aged 50 years and older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer

		No current HT use			Current HT use		
Interval 1 (weight 2 – weight 1) <sup>†</sup>	Interval 2 (weight 3 – weight 2) <sup>†</sup>	Cases	HR*	95% CI	Cases	HR*	95% CI
Weight loss >2-≤4.5kg	Kept the weight off/lost more weight	200	0.82	(0.70-0.96)	112	0.97	(0.79-1.20)
Weight loss >4.5-<9kg		145	0.75	(0.63-0.90)	73	0.98	(0.76-1.27)
Weight loss ≥9kg		45	0.68	(0.50-0.93)	23	0.96	(0.63-1.47)
Weight loss >2-≤4.5kg	Some regain of the lost weight	0	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight loss >4.5-<9kg		69	1.09	(0.85-1.40)	31	0.99	(0.68-1.44)
Weight loss ≥9kg		50	0.73	(0.55-0.98)	22	0.76	(0.50-1.18)
Weight loss >2-≤4.5kg	Gained all previously lost weight back/gained more weight	203	0.97	(0.83-1.13)	116	0.92	(0.75-1.13)
Weight loss >4.5-<9kg		87	0.80	(0.64-1.01)	71	1.16	(0.90-1.50)
Weight loss ≥9kg		31	1.05	(0.73-1.52)	11	N/A <sup>‡</sup>	--
Stable weight (within +/- 2kg)	Lost > 2kg	332	0.90	(0.79-1.02)	175	0.99	(0.82-1.18)
	Stable weight (within +/- 2kg)	712	1.00	ref	449	1.00	ref
	Gain >2kg	476	1.06	(0.94-1.19)	328	1.05	(0.91-1.21)
Weight gain >2-≤4.5kg	Lost all previously gained weight/lost more	237	0.89	(0.77-1.04)	147	0.94	(0.78-1.14)
Weight gain >4.5-<9 kg		123	0.93	(0.76-1.13)	65	0.91	(0.70-1.19)
Weight gain ≥9-<13.5 kg		20	0.92	(0.59-1.44)	8	N/A <sup>‡</sup>	--
Weight gain ≥13.5+ kg		12	N/A <sup>‡</sup>	--	2	N/A <sup>‡</sup>	--
Weight gain >2-≤4.5kg	Lost some of the weight gained	0	N/A <sup>‡</sup>	--	1	N/A <sup>‡</sup>	--
Weight gain >4.5-<9 kg		88	1.05	(0.83-1.32)	56	1.08	(0.81-1.43)
Weight gain ≥9-<13.5 kg		49	0.91	(0.68-1.22)	33	1.05	(0.74-1.50)
Weight gain ≥13.5+ kg		39	1.06	(0.76-1.47)	17	0.99	(0.61-1.61)
Weight gain >2-≤4.5kg	Kept the gained weight on/gained more weight	472	1.02	(0.91-1.15)	335	1.08	(0.93-1.24)
Weight gain >4.5-<9 kg		491	1.13	(1.00-1.27)	314	1.15	(0.99-1.33)
Weight gain ≥9-<13.5 kg		123	1.07	(0.88-1.30)	81	1.28	(1.01-1.63)
Weight gain ≥13.5+ kg		46	1.02	(0.76-1.39)	23	0.90	(0.59-1.38)

Abbreviations: kg, kilogram; HR, hazard ratio; HT, postmenopausal hormone therapy; CI, confidence interval; N/A, not applicable

\*Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for body mass index at the start of Interval 1, physical activity at the start of Interval 1, and postmenopausal hormone therapy use at start of breast cancer follow-up.

<sup>†</sup>Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years. Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2).

<sup>‡</sup>Hazard ratios were not reported for categories with fewer than 15 cases.

<sup>§</sup>All statistical tests are two-sided

Supplementary Table 5. Associations between weight change and risk of breast cancer by estrogen receptor status, among women aged 50 years or older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer.

Interval 1 (weight 2 – weight 1) <sup>†</sup>	Interval 2 (weight 3 – weight 2) <sup>†</sup>	ER <sup>+</sup> Cases n=5,348	HR <sup>*</sup>	95% CI	ER <sup>-</sup> Cases n=869	HR <sup>*</sup>	95% CI
Weight loss >2-4.5kg	Kept the weight off/lost more weight	245	0.82	(0.71- 0.94)	47	1.01	0.72-1.40
Weight loss >4.5-<9kg		183	0.83	(0.71-0.98)	29	0.89	0.59-1.32
Weight loss ≥9kg		56	0.72	(0.55-0.95)	9	N/A <sup>‡</sup>	--
Weight loss >2-4.5kg	Some regain of the lost weight	0	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight loss >4.5-<9kg		81	1.06	(0.84- 1.33)	11	N/A <sup>‡</sup>	--
Weight loss ≥9kg		54	0.65	(0.49-0.86)	16	1.47	0.87-2.49
Weight loss >2-4.5kg	Gained all previously lost weight back/gained more weight	269	0.94	(0.82-1.08)	42	0.92	0.65-1.30
Weight loss >4.5-<9kg		130	0.88	(0.73-1.06)	28	1.28	0.85-1.93
Weight loss ≥9kg		41	1.11	(0.80-1.52)	2	N/A <sup>‡</sup>	--
Stable weight (within +/- 2kg)	Lost > 2kg	408	0.90	(0.80-1.01)	65	0.91	0.68-1.23
	Stable weight (within +/- 2kg)	937	1.00	ref	155	1.00	ref
	Gain >2kg	677	1.06	(0.96-1.17)	108	1.03	0.80-1.32
Weight gain >2-4.5kg	Lost all previously gained weight/lost more	317	0.90	(0.79-1.03)	53	0.95	(0.69-1.30)
Weight gain >4.5-<9 kg		143	0.83	(0.69-0.99)	23	0.87	(0.56-1.36)
Weight gain 9-<13.5 kg		22	0.84	(0.55-1.28)	5	N/A <sup>‡</sup>	--
Weight gain ≥13.5 kg		12	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight gain >2-4.5kg	Lost some of the weight gained	2	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight gain >4.5-<9 kg		112	1.01	(0.83-1.22)	19	1.01	(0.62-1.64)
Weight gain 9-<13.5 kg		61	0.86	(0.66-1.12)	14	N/A <sup>‡</sup>	--
Weight gain ≥13.5 kg		45	1.02	(0.75-1.38)	8	N/A <sup>‡</sup>	--
Weight gain >2-4.5kg	Kept the gained weight on/gained more weight	673	1.06	(0.96-1.17)	114	1.10	(0.86-1.41)
Weight gain >4.5-<9 kg		654	1.12	(1.02-1.25)	91	0.96	(0.74-1.26)
Weight gain 9-<13.5 kg		166	1.14	(0.96-1.35)	26	1.10	(0.72-1.67)
Weight gain ≥13.5 kg		60	1.02	(0.78-1.32)	4	N/A <sup>‡</sup>	--

Abbreviations: kg, kilogram; ER, estrogen receptor; HR, hazard ratio; CI, confidence interval; N/A, not applicable

\*Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for body mass index at the start of Interval 1, physical activity at the start of Interval 1, and postmenopausal hormone therapy use at start of breast cancer follow-up.

<sup>†</sup>Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years. Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2).

<sup>‡</sup>Hazard ratios were not reported for categories with fewer than 15 cases.

<sup>§</sup>All statistical tests are two-sided

Supplementary Table 6. Associations between weight change and risk of breast cancer by baseline BMI, among women aged 50 years or older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer.

Interval 1 (weight 2 – weight 1) <sup>†</sup>	Interval 2 (weight 3 – weight 2) <sup>†</sup>	BMI <25 kg/m <sup>2</sup>			BMI 25-<30 kg/m <sup>2</sup>			BMI ≥30 kg/m <sup>2</sup>		
		Cases	HR	95% CI	Cases	HR	95% CI	Cases	HR	95% CI
Weight loss >2-4.5 kg	Kept the weight off/lost more weight	125	0.92	(0.76-1.11)	120	0.81	(0.66-1.00)	93	0.96	(0.73-1.27)
Weight loss >4.5-<9 kg		60	0.93	(0.72-1.22)	88	0.78	(0.61-0.98)	89	0.88	(0.67-1.16)
Weight loss ≥9 kg		5	N/A <sup>‡</sup>	--	24	0.76	(0.50-1.16)	44	0.79	(0.56-1.12)
Weight loss >2-4.5 kg	Some regain of the lost weight	0	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight loss >4.5-<9 kg		26	1.02	(0.69-1.51)	44	0.93	(0.68-1.28)	35	1.34	(0.91-1.96)
Weight loss ≥9 kg		8	N/A <sup>‡</sup>	--	26	0.74	(0.49-1.10)	46	0.81	(0.57-1.14)
Weight loss >2-4.5 kg	Gained all previously lost weight back/gained more weight	132	0.90	(0.75-1.08)	151	1.03	(0.85-1.25)	59	0.86	(0.62-1.18)
Weight loss >4.5-<9 kg		42	1.00	(0.73-1.36)	69	0.84	(0.65-1.10)	59	0.94	(0.69-1.29)
Weight loss ≥9 kg		5	N/A <sup>‡</sup>	--	15	1.01	(0.60-1.70)	28	0.99	(0.65-1.51)
Stable weight (within +/- 2 kg)	Lost > 2kg	209	0.94	(0.81-1.10)	193	0.84	(0.71-1.01)	137	1.00	(0.78-1.28)
	Stable weight (within +/- 2kg)	765	1.00	ref	350	1.00	ref	119	1.00	ref
	Gain >2kg	437	1.04	(0.93-1.18)	285	1.00	(0.85-1.17)	139	1.23	(0.96-1.58)
Weight gain >2-4.5 kg	Lost all previously gained weight/lost more	173	0.88	(0.74-1.04)	141	0.86	(0.70-1.04)	90	1.07	(0.81-1.41)
Weight gain >4.5-<9 kg		51	N/A <sup>‡</sup>	(0.60-1.07)	93	1.10	(0.87-1.38)	54	0.86	(0.62-1.19)
Weight gain 9-<13.5 kg		4	N/A <sup>‡</sup>	--	9	N/A <sup>‡</sup>	--	16	1.08	(0.64-1.84)
Weight gain ≥13.5 kg		2	N/A <sup>‡</sup>	--	3	N/A <sup>‡</sup>	--	9	N/A <sup>‡</sup>	--
Weight gain >2-4.5 kg	Lost some of the weight gained	1	N/A <sup>‡</sup>	--	1	--	N/A <sup>‡</sup>	0	N/A <sup>‡</sup>	--
Weight gain >4.5-<9 kg		58	1.04	(0.80-1.37)	59	0.98	(0.74-1.30)	29	1.05	(0.69-1.59)
Weight gain 9-<13.5 kg		28	0.93	(0.64-1.36)	39	1.08	(0.77-1.52)	18	0.80	(0.49-1.32)
Weight gain ≥13.5 kg		12	N/A <sup>‡</sup>	--	26	1.26	(0.83-1.90)	20	1.03	(0.64-1.67)
Weight gain >2-4.5 kg	Kept the gained weight on/gained more weight	436	1.03	(0.91-1.16)	304	1.06	(0.91-1.24)	109	1.03	(0.79-1.34)
Weight gain >4.5-<9 kg		381	1.15	(1.01-1.30)	313	1.08	(0.92-1.26)	138	1.11	(0.87-1.43)
Weight gain 9-<13.5 kg		75	1.09	(0.86-1.39)	89	1.15	(0.91-1.46)	50	1.32	(0.95-1.85)
Weight gain ≥13.5 kg		18	0.82	(0.51-1.32)	40	1.38	(0.98-1.93)	14	N/A <sup>‡</sup>	--

Abbreviations: BMI, body mass index; kg, kilogram; HR, hazard ratio; CI, confidence interval; N/A, not applicable

<sup>\*</sup>Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for physical activity at the start of Interval 1, and postmenopausal hormone therapy use at start of breast cancer follow-up.

<sup>†</sup>Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years. Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2).

<sup>‡</sup>Hazard ratios were not reported for categories with fewer than 15 cases.

<sup>§</sup>All statistical tests are two-sided

Supplementary Table 7. Associations between weight change and risk of breast cancer stratified by baseline physical activity level, among women aged 50 years or older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer.

Interval 1 (weight 2 – weight 1) †	Interval 2 (weight 3 – weight 2) †	Low PA			Moderate PA			High PA		
		N Cases	HR*	95% CI	N Cases	HR*	95% CI	N Cases	HR*	95% CI
Weight loss >2-4.5 kg		150	0.93	(0.77-1.13)	92	0.85	(0.67-1.07)	71	0.98	(0.62-1.56)
Weight loss >4.5-<9 kg	Kept the weight off/lost more weight	105	0.90	(0.73-1.12)	74	0.88	(0.68-1.13)	49	0.75	(0.55-1.02)
Weight loss ≥9 kg		25	0.56	(0.37-0.84)	25	0.94	(0.61-1.43)	20	0.74	(0.57-0.96)
Weight loss >2-4.5 kg	Some regain of the lost weight	0	N/A ‡	--	0	N/A ‡	--	0	N/A ‡	--
Weight loss >4.5-<9 kg		36	0.98	(0.71-1.37)	20	1.28	(0.91-1.82)	26	0.98	(0.65-1.48)
Weight loss ≥9 kg		39	0.75	(0.53-1.06)	36	0.72	(0.45-1.13)	20	1.01	(0.64-1.60)
Weight loss >2-4.5 kg	Gained all previously lost weight back/gained more weight	137	0.98	(0.81-1.19)	106	0.93	(0.75-1.16)	80	0.85	(0.66-1.09)
Weight loss >4.5-<9 kg		73	0.95	(0.74-1.22)	59	1.06	(0.80-1.41)	32	0.74	(0.51-1.07)
Weight loss ≥9 kg		25	1.23	(0.82-1.86)	14	N/A ‡	--	9	N/A ‡	--
Stable weight (within +/- 2 kg)	Lost > 2kg	219	0.94	(0.80-1.11)	175	1.00	0.83-1.20	114	0.77	(0.62-0.95)
	Stable weight (within +/- 2kg)	452	1.00	ref	357	1.00	ref	377	1.00	ref
	Gain >2kg	333	1.09	0.94-1.26	263	1.03	0.88-1.22	224	1.01	(0.85-1.19)
Weight gain >2-4.5 kg	Lost all previously gained weight/lost more	162	0.96	(0.80-1.15)	120	0.84	(0.68-1.04)	105	0.89	(0.72-1.11)
Weight gain >4.5-<9 kg		86	0.98	(0.78-1.24)	53	0.80	(0.60-1.08)	50	0.89	(0.66-1.20)
Weight gain 9-<13.5 kg		20	1.35	(0.85-2.12)	6	N/A ‡	--	3	N/A ‡	--
Weight gain ≥13.5 kg		6	N/A ‡	--	5	N/A ‡	--	2	N/A ‡	--
Weight gain >2-4.5 kg	Lost some of the weight gained	2	N/A ‡	--	0	N/A ‡	--	0	N/A ‡	--
Weight gain >4.5-<9 kg		56	0.94	(0.71-1.15)	44	1.10	(0.80-1.51)	37	0.97	0.69-1.37
Weight gain 9-<13.5 kg		32	0.88	(0.62-1.27)	24	0.89	(0.58-1.35)	26	1.16	0.77-1.73
Weight gain ≥13.5 kg		28	1.16	(0.78-1.72)	17	1.05	(0.64-1.71)	9	N/A ‡	--
Weight gain >2-4.5 kg	Kept the gained weight on/gained more weight	322	1.05	(0.91-1.22)	269	1.06	(0.90-1.24)	220	1.01	0.86-1.20
Weight gain >4.5-<9 kg		325	1.14	(0.99-1.32)	259	1.10	(0.93-1.30)	219	1.15	(0.97-1.36)
Weight gain 9-<13.5 kg		94	1.22	(0.97-1.53)	66	1.24	(0.95-1.61)	49	1.07	(0.79-1.46)
Weight gain ≥13.5 kg		34	1.14	(0.80-1.62)	21	0.97	(0.62-1.51)	14	0.74	(0.42-1.29)

Abbreviations: PA, physical activity; kg, kilogram; HR, hazard ratio; CI, confidence interval; N/A, not applicable

\*Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for body mass index at the start of Interval 1 and postmenopausal hormone therapy use at start of breast cancer follow-up.

†Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2). Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years

‡Hazard ratios were not reported for categories with fewer than 15 cases.

§All statistical tests are two sided

Supplementary Table 8. Associations between weight change and risk of breast cancer by weight ascertainment method (self-report, measured), among women aged 50 years or older in 10 cohorts in the Pooling Project of Prospective Studies of Diet and Cancer.

		All studies (results in manuscript)		Measured <sup>§</sup> weight, height			Self-reported <sup>  </sup> weight, height		
Interval 1 (weight 2 – weight 1) <sup>†</sup>	Interval 2 (weight 3 – weight 2) <sup>†</sup>	HR*	95% CI	N cases	HR*	95% CI	N cases	HR*	95% CI
Weight loss >2-4.5kg	Kept the weight off/ lost more weight	0.87	(0.77-0.99)	69	0.89	(0.67-1.18)	269	0.87	(0.76-1.00)
Weight loss >4.5-<9kg		0.84	(0.73-0.96)	40	0.77	(0.55-1.10)	197	0.85	(0.73-1.00)
Weight loss ≥9kg		0.74	(0.58-0.94)	12	N/A <sup>‡</sup>	--	61	0.76	(0.59-0.99)
Weight loss >2-4.5kg	Some regain of the lost weight	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--	0	N/A <sup>‡</sup>	--
Weight loss >4.5-<9kg		1.06	(0.87-1.30)	20	1.12	(0.70-1.78)	85	1.05	(0.84-1.31)
Weight loss ≥9kg		0.77	(0.62-0.97)	20	0.96	(0.60-1.54)	60	0.73	(0.56-0.95)
Weight loss >2-4.5 kg	Gained all previously lost weight back/gained more weight	0.94	(0.83-1.06)	64	0.86	(0.64-1.15)	278	0.95	(0.83-1.09)
Weight loss >4.5-<9 kg		0.91	(0.78-1.07)	33	0.89	(0.61-1.29)	137	0.92	(0.77-1.10)
Weight loss ≥9 kg		1.02	(0.76-1.37)	10	N/A <sup>‡</sup>	--	38	0.98	(0.71-1.37)
Stable weight (within +/- 2 kg)	Lost > 2kg	0.92	(0.83-1.02)	104	0.85	(0.67-1.09)	435	0.94	(0.84-1.05)
	Stable weight (within +/- 2kg)	1.00	ref	185	1.00	ref	1049	1.00	ref
	Gain >2kg	1.05	(0.96-1.15)	125	0.93	(0.74-1.18)	736	1.07	(0.97-1.18)
Weight loss >2-4.5 kg	Lost all previously gained weight/lost more	0.90	(0.81-1.01)	73	0.90	(0.68-1.18)	331	0.91	(0.80-1.03)
Weight gain >4.5-<9 kg		0.91	(0.78-1.06)	26	0.82	(0.55-1.25)	172	0.93	(0.79-1.10)
Weight gain 9-<13.5 kg		0.87	(0.60-1.26)	3	N/A <sup>‡</sup>	--	26	0.91	(0.61-1.34)
Weight gain ≥13.5 kg		N/A <sup>‡</sup>	--	3	N/A <sup>‡</sup>	--	11	N/A <sup>‡</sup>	--
Weight gain >2-4.5 kg	Lost some of the previously gained weight	N/A <sup>‡</sup>	--	1	N/A <sup>‡</sup>	--	1	N/A <sup>‡</sup>	--
Weight gain >4.5-<9 kg		1.02	(0.86-1.21)	24	1.28	(0.84-1.97)	122	0.98	(0.81-1.18)
Weight gain 9-<13.5 kg		0.95	(0.76-1.18)	11	N/A <sup>‡</sup>	--	74	0.93	(0.74-1.18)
Weight gain ≥13.5 kg		1.01	(0.78-1.33)	5	N/A <sup>‡</sup>	--	53	1.05	(0.79-1.39)
Weight gain >2-4.5 kg	Kept the gained weight on/gained more	1.04	(0.95-1.14)	138	1.22	(0.97-1.52)	711	1.01	(0.92-1.12)
Weight gain >4.5-<9 kg		1.12	(1.02-1.22)	89	1.08	(0.83-1.39)	743	1.12	(1.02-1.23)
Weight gain 9-<13.5 kg		1.14	(0.99-1.33)	11	N/A <sup>‡</sup>	--	203	1.20	(1.03-1.40)
Weight gain ≥13.5 kg		0.97	(0.76-1.23)	10	N/A <sup>‡</sup>	--	62	0.93	(0.71-1.20)

Abbreviations: kg, kilogram; HR, hazard ratio; CI, confidence interval; N/A, not applicable

\*Cox models were stratified by cohort, age, and calendar year at the start of breast cancer follow-up and adjusted for physical activity at the start of Interval 1, and postmenopausal hormone therapy use at start of breast cancer follow-up.

<sup>†</sup>Weight change over both intervals modeled as a single categorical variable reflecting the weight change pattern over ~ten years. Weight change intervals were each ~5 years (Median across studies: 5.2 years for Interval 1 and 4.6 years for Interval 2).

<sup>‡</sup>Hazard ratios were not reported for categories with fewer than 15 cases.

<sup>§</sup> Cohorts with measured weight and height are Melbourne Collaborative Cohort Study and Women's Health Initiative Clinical Trial

<sup>||</sup> Cohorts with self-reported weight and height are CLUE II: Campaign Against Cancer and Heart Disease, Cancer Prevention Study II Nutrition Cohort, Iowa Women's Health Study, Japan Public Health Center-Based Study Cohort I and II, Melbourne Collaborative Cohort Study, New York University Women's Health Study, Nurses' Health Study, and Women's Health Study

\*\*All statistical tests are two sided.